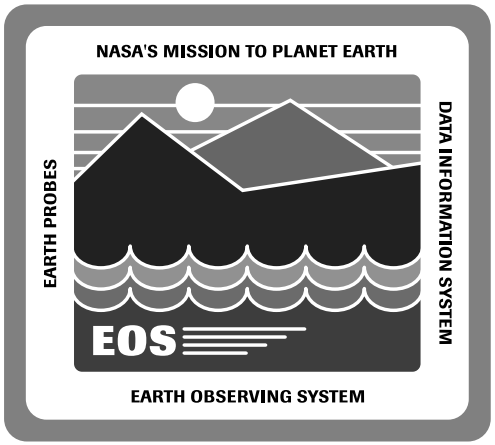


CDR-A Planning

Paul W. Fingerman

30 June 1995

Purpose of the CDR
(from SOW 3.4.2)

"The purpose of the CDR shall be to:

a. Demonstrate that the detailed design of the element [subsystem] under review satisfies the performance and functional requirements of the development specifications;

b. Establish the detailed design compatibility among the element and other ECS elements [subsystems], facilities, software, and personnel;

c. Assess element [subsystem] risk areas, including technical, cost, and schedule risks;

d. Assess the results of the producibility analyses conducted on system hardware;

e. Review the preliminary hardware product specifications;

f. Determine the acceptability of the detailed design, performance, and test characteristics of the software design solution;

g. Determine the adequacy of the operation and support documents.

SOW 2.4.4: Element-Level Reviews -- CDR

“There will be a series of Critical Design Reviews (CDRs) ... conducted prior to undertaking final coding of software for each system Release. Each CDR will address detailed element[subsystem]-level design, including such details as Program Design Language (PDL) for key software modules, and element [subsystem] interfaces for the next Release. The contractor shall document in each CDR how the results of the Contractor and Government prototyping efforts, studies, and user experience with the currently operating ECS Release are being incorporated into the ECS element[subsystem]-level design of the next Release. The Contractor shall also show how the results of the previous CRR have been incorporated into the element[subsystem]-level design of the next Release.

SOW 3.4.2: Element Critical Design Reviews

"When the Detailed Design Specification for an element [subsystem] release is complete, the Contractor shall conduct a Critical Design Review (CDR) for that element [subsystem]. The CDR shall be presented to the CO/COTR prior to undertaking final coding of the software for the release. Each CDR shall address element[subsystem]-level design and element [subsystem] interfaces for the next release. The Contractor shall document in each CDR how the results of Contractor and Government prototyping efforts, studies, and user experience with the currently operating ECS Release or EOSDIS Version are being incorporated into the ECS design of the next release. The Contractor shall also show how the results of the previous CDR have been incorporated into the design of the next release."

CDR Planning Dimensions

- High-level schedule
- Design development
- Documents & production
- “Event” briefings & logistics
- ESDIS coordination
- RID management
- Success criteria
- Oversight
- Post-CDR

High-Level Schedule

CDR plan deployment	**6/5/95 -- 6/22/95**
Revised Technical Baseline	**6/23/95**
Design & coordination	**thru 6/30/95**
Design subsystem freezes	**6/26/95--7/14/95**
Rel A DID production	**6/30/95--7/23/95**
DMO DID production:	
CCB & DMO processing	**7/10/95--7/31/95**
Last CCB	**7/23/95**

(Requires rolling freezes and production processes)

Deliver CDRL DIDs **7/31/95**

Other CDR deliverables (Non-CDRL DID documents)

- **into production by** **8/7/95**
- **delivered** **8/2/95 -- 8/14/95**

(continued)

High-Level Schedule (cont.)

CDR "event"

• CDR announcement published	7/ 5/95
• CDR agenda coordinated	6/23/95
• Review panel selected & invited	6/30/95
• Invitees selected & invited	7/15/95
• Event logistics plan complete	7/31/95
• CDR event agenda distributed	7/31/95
• CDR briefings prepared	7/15/95--8/7/95
• CDR dry runs (rolling wave)	8/7/95 -- 8/11/95

RID management plan complete 8/7/95

Design Development

Close issues *ASAP*

- **technical**
- **PDR**
- **RIDs**
- **ESDIS comments**

Validate design against architecture, PDR, RIDs, IAS EVO promises, other

Pre-coordinate ECS management/ESDIS approval

- **design telecons, walk-thrus, inspections**
- **“Early-birds”**

Keep Release B aware

Design Development

Central Technical Issues

Technology selections, COTS & standards selections, knotty design problems, etc.

Examples:

- ~~Universal reference~~
- ~~DES data replication~~
- ~~DCE 1/1.1/1.2--OODCE--CORBA~~
- Performance
  - Budgets by CI by release
  - Response time/thruput/ capacity/sizing
- Permissible internal interface techniques
  - Distributed object management
- Security
- PGS toolkit migration from Ir1 (non-DCE) to Rel. A (DCE)
- Distributed object management across subsystems
- Operability (startup, shutdown, failure & recovery modes)
- Mode management & transition approach
- Multicast

Design Development

Validate design against PDR and RID responses

Should be a no-brainer, but needs to be on the design activity checklist

- **PDR breakage**
- **Various issue databases**
- **DMO will provide PDR RID responses by subsystem/release**
- **IAS recommendations promised for Rel A (“EVO”)**
- **Other PDR commitments**
  - **Additional trade studies**
  - **White papers**

Design Development

Other Issues

Technical coordination, contractual, and communications issues

Examples:

Issue	Assignee
~~Development metrics consistency~~	~~Fingerman~~
Disapproved deliverables	Endal
• 311	Armstrong
• 307/329	Dalnekoff
PI on non-C/C++ pseudocode (cf. PDL)	*Ambardekar*

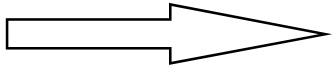
Design Development

Pre-coordinate ECS management/ESDIS approval

Too much documentation to wait for CCB reviews to satisfy ECS management concerns

&

Too much design to wait for CDR to receive ESDIS input



***Early-bird* subsystem briefings**

- **Storyboard reviews of subsystem designs, emphasizing key design issues, high leverage decisions:**

COTS selections	**Interface characteristics**
Unexpected results	**High-SLOC components**

Technical, schedule, cost risks

- **Brief SCDO/ECS management to obtain required buy-in on design**
- **Brief ESDIS counterparts and obtain early buy-in on design**
- **Conduct briefings *before* final freezing of detailed design *before* completing document/DID**

Early-Bird Briefings

DATE	DAY	SUBSYSTEM(s)	TIME	ROOM
6/27/95	Tuesday	1. Client & V0 Gateway 2. Interoperability (Advertising)	2-5	2030
6/28/95	Wednesday	1. Data Server	2-5	2030
6/29/95	Thursday	1. Ingest	10-12	2030
7/6/95	Thursday	1. Design Issues 2. Interfaces	1-5	Auditorium
7/7/95	Friday	1. Planning & Processing	9-12	2030
7/10/95	Monday	1. MSS 2. CSS	2-5	Auditorium

Design Development

Keep Release B aware

- Coordinated document plan
- Participation in design inspections, early-birds
- Participation in technical review teams (“green teams”)
- Use OMT with planned snapshot copy for ongoing design and later resynchronization
- Cross-release technical issues to the X-Release Bulletin Board

Design Development & Documentation

"Design Complete" Checklist

- Complete static, dynamic, & functional (as needed) models
  - Static mapped to objects
  - State diagrams
  - Data flow diagrams for complex class interactions
- Objects/object components
- Intra-CI interfaces
- Inter-CI interfaces
  - Event flow diagrams
- External interfaces mapped to internal interfaces
- Event traces, scenarios, & user-interface dialogs
- Physical topology
- Performance model
- PDL/pseudocode for "significant" CSUs
- CS & HW CIs
- COTS
- Results of prototyping and integration of findings
- Data dictionary
- Database & schema definition
- Requirements traceability (functional & performance)
- Human-machine interface
- Operability
  - Manageability
  - Failure modes
  - Recoverability
- Risks
  - Technical
  - Schedule
  - Cost

Document Production

- Required documents in Document Control Matrix, which includes
  - Book bosses
  - Schedules
  - CCB responsibility
- Document types & structure
- Book Bosses/book teams/internal review teams
  - Tools, guidelines, training
- Production process
- Final publication process & schedule

Document Production

Required Documents (1 of 2)

ECS Doc No.	Title	Office	Book Boss	Pgs.	Figs.	CCB	CDR Version Cntl Date	CCB Date	Due to DMO	Delivery
205-CD-001-002	Science Users Guide and Operations Procedure Handbook, Parts 1-3	SCDO	Colucci			n/a				7/14/95
305-CD-004-001	Science and Communications Development Office (SCDO) Design Release A Overview For the ECS Project	SCDO	Solomon, Carl	200	30	R-A	7/10/95	7/23/95		7/31/95
305-CD-005-001	Release A SDPS Client Subsystem Design Specification for the ECS Project	SCDO	Farley, J.	90	6	R-A	6/30/95	7/13/95		7/31/95
305-CD-006-001	Release A SDPS Interoperability Subsystem Design Specification for the ECS Project	SCDO	Farley, J.	50	5	R-A	7/5/95	7/13/95		7/31/95
305-CD-007-001	Release A SDPS Data Management Subsystem Design Specification for the ECS Project	SCDO	Farley, J.	50	5	R-A	6/30/95	7/13/95		7/31/95
305-CD-008-001	Release A SDPS Data Server Subsystem Design Specification for the ECS Project	SCDO	Huber, M	300	25	R-A	7/5/95	7/14/95		7/31/95
305-CD-009-001	Release A SDPS Ingest Subsystem Design Specification for the ECS Project	SCDO	Gire, C	190	30	R-A	7/5/95	7/14/95		7/31/95
305-CD-010-001	Release A SDPS Planning Subsystem Design Specification for the ECS Project	SCDO	Martin, J	275	40	R-A	7/10/95	7/17/95		7/31/95
305-CD-011-001	Release A SDPS Data Processing Subsystem Design Specification for the ECS Project	SCDO	Shannon, JM	130	20	R-A	7/14/95	7/21/95		7/31/95
305-CD-012-001	Release A CSMS Communications Subsytem Design Specification for the ECS Project	SCDO	Winston, E	210	40	R-A	6/30/95	7/10/95		7/31/95
305-CD-013-001	Release A CSMS Management Subsystem Design Specification for the ECS Project	SCDO	Forman, G	150	25	R-A	7/7/95	7/17/95		7/31/95
305-CD-014-001	Release A GSFC DAAC Implementation/Design Specification for the ECS Project	SCDO	Armstrong, M	110	15	R-A	7/10/95	7/18/95		7/31/95
305-CD-015-001	Release A LaRC DAAC Implementation/Design Specification for the ECS Project	SCDO	Armstrong, M	110	15	R-A	7/10/95	7/18/95		7/31/95
305-CD-016-001	Release A MSFC DAAC Implementation/Design Specification for the ECS Project	SCDO	Armstrong, M	110	15	R-A	7/10/95	7/18/95		7/31/95
305-CD-017-001	Release A EDC DAAC Implementation/Design Specification for the ECS Project	SCDO	Armstrong, M	110	15	R-A	7/10/95	7/18/95		7/31/95
305-CD-018-001	Project	SCDO	Gorsky, R			R-A				7/31/95
308-CD-001-004	Software Development Plan for the ECS Project	SCDO	Ambardekar			ECS				7/21/95
311-CD-002-003	SDPS Database Design and Database Schema Specifications for the ECS Project	SCDO	Dakos, R.			R-A		7/28/95		8/2/95
311-CD-003-003	CSMS Database Design and Database Schema Specifications for the ECS Project	SCDO	Singhal/MSA	250	10	R-A		7/28/95		8/2/95
313-CD-004-001	Release A CSMS/SDPS Internal Interface Control Document for the ECS Project	SCDO	Solomon, C.	140	30	ECS	7/10/95	7/18/95		7/31/95
333-CD-003-001	SDP Toolkit 5 Users Guide for the ECS Project	SCDO	Klein, L.			R-A				7/30/95
520-CD-001-003	Release A Software Critical Items List for the ECS Project	SCDO	McDonald, M		1	PM				7/31/95
604-CD-003-001	Release A - Release Operations Concept Document for the ECS Project, vol 2	SCDO	Herring, D			R-A				7/15/95
605-CD-001-001	Release A Operations Scenarios for the ECS Project	SCDO	Herring, D			R-A				7/31/95

See CDR Admin BBS on CCMail for latest update

Document Production

Required Documents (2 of 2)

ECS Doc No.	Title	Office	Book Boss	Pgs.	Figs.	CCB	CDR Version Cntl Date	CCB Date	Due to DMO	Delivery
205-CD-002-002	Science Users Guide and Operations Procedure Handbook, Part 4	SO	Cox, K			n/a				
209-CD-001-002	Interface Control Document Between EOSDIS Core System (ECS) and NASA Science Internet	SMO	Armstrong, M			ECS				7/31/95
209-CD-002-002	Interface Control Document Between EOSDIS Core System (ECS) and ASTER Ground Data System	SMO	Chachulski			ECS				7/31/95
209-CD-003-002	Analysis Software	SMO	Chachulski			ECS				7/31/95
209-CD-004-002	Data Format Control Document for the Earth Observing System (EOS) AM-1 Project Database	SMO	LLoyd, C			ECS				7/31/95
209-CD-005-002	Interface Control Document Between EOSDIS Core System (ECS) and Science Computing Facilities (SCF)	SMO	West, S			ECS				7/31/95
209-CD-006-002	Interface Control Document Between EOSDIS Core System (ECS) and the National Oceanographic and Atmosphere Administration (NOAA) Affiliated Data Center (ADC)	SMO	Dunning, R			ECS				7/31/95
209-CD-007-002	Interface Control Document Between EOSDIS Core System (ECS) and TRMM Science Data and Information System (TSDIS)	SMO	West, S			ECS				7/31/95
209-CD-008-002	Interface Control Document Between EOSDIS Core System (ECS) and Goddard Space Flight Center (GSFC) Distributed Active Archive Center (DAAC) for the ECS Project	SMO	Banaszak, S			ECS				7/31/95
209-CD-009-002	Interface Control Document Between EOSDIS Core System (ECS) and Marshall Space Flight Center (MSFC) Distributed Active Archive Center (DAAC) for the ECS Project	SMO	Singleton, B			ECS				7/31/95
209-CD-011-002	Interface Control Document Between the EOSDIS Core System (ECS) and the Version 0 System for the ECS Project	SMO	Banaszak, S			ECS				7/31/95
404-CD-001-001	Proc. For Control of Unscheduled Activities During Verification	SMO	Scott, G.			ECS				8/7/95
504-CD-001-002	Release A Data on Previously Designed or COTS for the ECS Project	QO	Spyrison, J			R-A				7/31/95
511-CD-001-001	Release A Maintainability Demonstration Plan for the ECS Project	QO	Spyrison, J			R-A				7/31/95
514-CD-001-003	Security Sensitive Items List for the ECS Project	SMO	Sims, J.			R-A				7/31/95
515-CD-001-003	Release A Availability Models/Predictions for the ECS Project	QO	Nguyen, B.	120		R-A				7/31/95
516-CD-001-003	Release A Reliability Predictions for the ECS Project	SMO	Nguyen, B.	40		R-A				7/31/95
518-CD-001-003	Release A Maintainability Predictions for the ECS Project	SMO	Nguyen, B.	40		R-A				7/31/95
522-CD-001-001	Release A Integration and Inspection Flow for the ECS Project	QO	Spyrison, J.			R-A				7/31/95
532-CD-001-001	Release A Environmental Control Plan for the ECS Project	TBD	TBD			ECS				7/14/95
614-CD-001-002	Release A Developed Software Maintenance Plan for the ECS Project	M&O	Creecy, R.			ECS				7/31/95
616-CD-002-001	Release A Integrated Logistics Support Plan for the ECS Project	M&O	Jaeger, T			ECS				7/31/95
618-CD-001-001	Release A Replacement Parts List and Spare Parts List	M&O	Jaeger, T			PM				7/31/95
622-CD-001-002	ECS Training Plan	M&O	Downes, E.			ECS				7/14/95
706-CD-001-001	Release A Critical Design Review Presentation Package	BOO	Wheeler, K.			PM				8/28/95

See CDR Admin BBS on CCMail for latest update

Document Production

Document Types

- Some documents are contractually required at CDR
  - 305, 313, 604, 605, etc.
  - Delivered by 7/31
- Some documents disapproved or heavily commented at PDR
  - 311 delivered by 8/2
- Some documents have comments pending
  - 304 responses “informally” in white paper by CDR
  - Critical responses will require CCR to baseline at Rel. A CCB
- Some documents committed “by CDR”
  - Trade study white papers
  - Delivered by 8/14
- Some supporting documents
  - e.g., human factors assessment white paper, to EDHS by 8/14

Document Production

Document Structure

Plan:

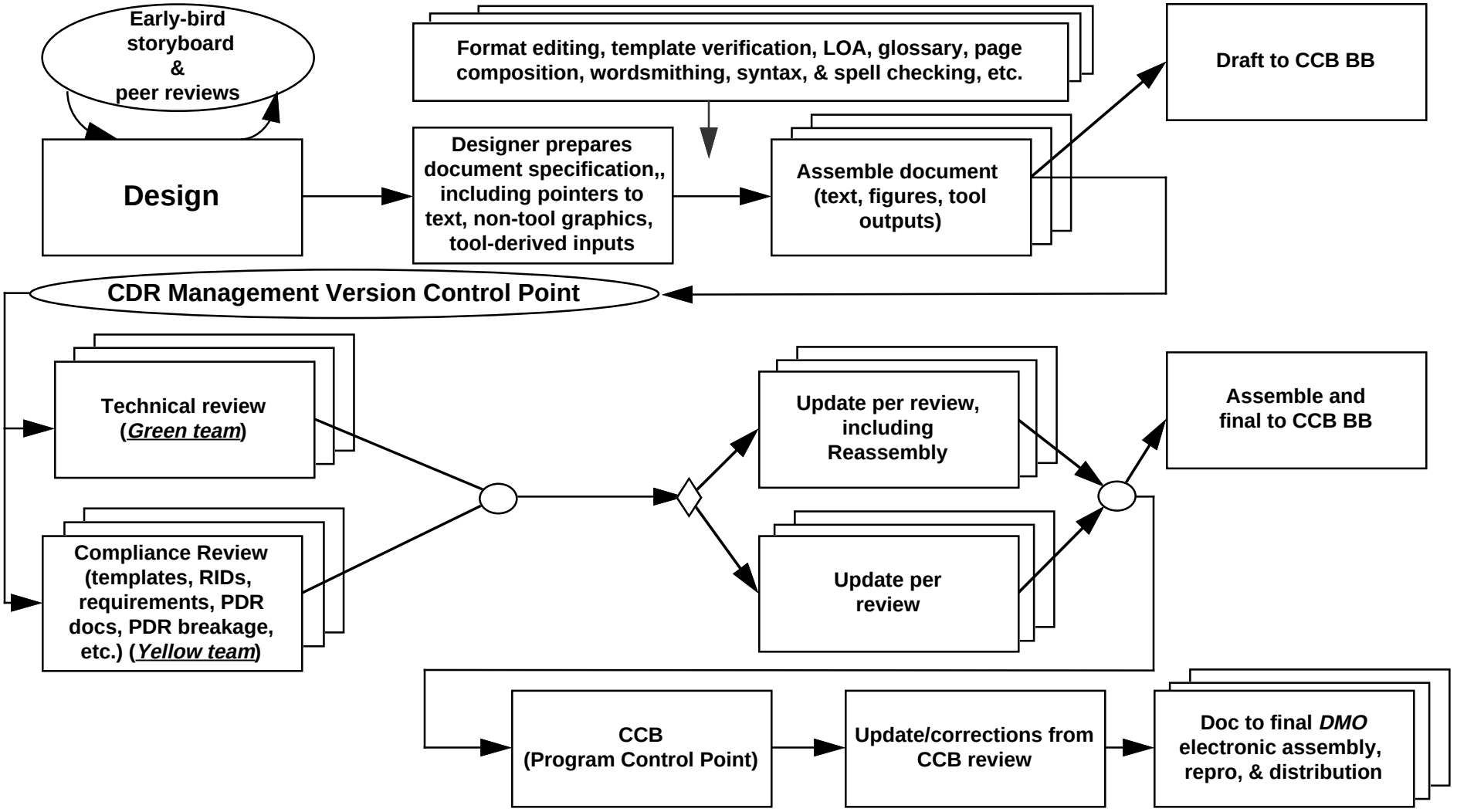
- **All requirement and test documents (304, 499, 403, 409) will be release-specific, and cumulative.**
- **All inter-CI interfaces documented in 313**
  - **Services offered**
  - **External-to-internal interface mapping; middleware**
  - **Event traces of all key inter-subsystem activities**
- **Design document (305) will be release-specific, with separate volume for each subsystem**
  - **“Volume 0” at Rel. A to provide update of technical architecture (from PDR 207), overview of subsystems & CIs, data dictionary, GUI framework, reference technical architecture (hardware, network), etc.**
  - **Material in Volume 0 at Rel. A will migrate to 207 at Rel. B**
  - **Additional volumes for each DAAC**
- **Document outlines**

Document Production

Book Bosses/Book Teams/Internal Review Teams

- **Book boss responsible for his/her volume through delivery**
  - **Create, preliminary assembly, respond to internal reviews, deliver to appropriate CCB, respond to CCB review, deliver to DMO, support delivery to customer as required**
- **PDR Book Boss training package**
- **Framemaker**
  - **Training**
- **Early-Bird briefing (already discussed)**
- **Early version control to support early reviews**
  - **Green team**
  - **Yellow team**

Document Production - Production Process



(Worst Case -- Heavy OMT Extract Content)

Document Production - Green and Yellow Teams

- Use non-inline personnel
  - Release B
  - DAAC liaisons
  - SMO
  - DMO
  - QO personnel
- Review is in addition to Release A peer walk-thrus, etc.
  - Forest, not trees
  - “Second set of eyes”
- Green = Technical Review
- Yellow = Compliance Review

Document Production - Green Team

- **Technical review**
- **Subsystem *and* cross-subsystem sanity checks**
  - **Each reviewer reads 3 volumes, overview, 2 subsystems/DAACS**
- **Consistency of models, data, requirements, architecture**
- **Quality and completeness of technical solution**
- **Design/document completeness (see checklist)**
- **Quality of issue responses, ops concepts sensitivity**

Document Production - Yellow Team

- **Compliance considerations:**
  - **RID follow-thru**
  - **Requirements traceability**

    Note: Requirements traceability matrices will probably not be present at CDR Version Control Point, and will need to be verified later in the process (from final version posted for CCB?)
  - **Risk analyses**
  - **Design completeness (see checklist)**
  - **Document template**
  - **Consistency with design databases (OMT, Data Dictionary)**

    Design description consistency (interfaces, figures vs. text)
  - **SDPS issues database**
  - **Other issues lists**

Document Production - Green and Yellow Teams

- **Reviewed by both teams, where Yellow Team verifies it's been attended to, and refers questions of quality of response to Green Team**
  - **PDR breakage**
  - **IAS recommendations**
  - **Architectural consistency**
  - **Standards compliance**

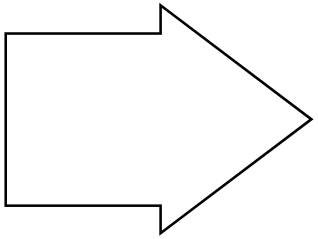
Documents & Production

Production Process

Key assumptions

- **Heavy dependence on producing most of 313/305/311 directly from OMT**
  - **Design directly into OMT**
  - **Framemaker makes OMT --> document much easier**
  - **Book bosses/admin trained on Framemaker**
  - **Adequate OMT performance being worked**

    Report problems!
- **Early-bird briefings**
- **Green team**
- **Yellow team**



Reduce rework at CCB

Documents & Production

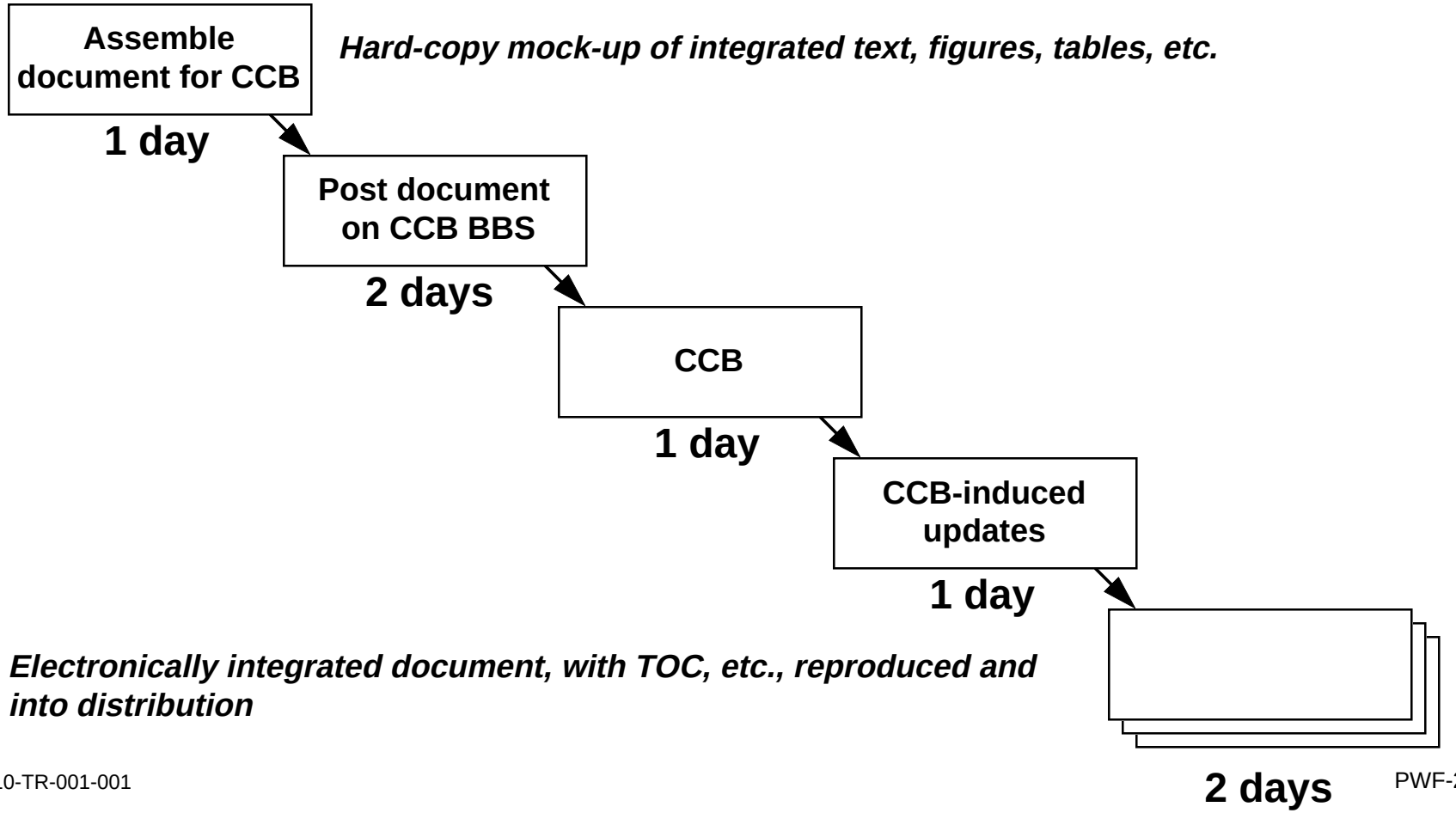
Production Process - Roles & Responsibilities

Documents	**Book Bosses (See Doc. matrix)**
Production schedules	**D. Herring, P. Ambardekar**
Early-Bird reviews	**R. Meyer, Subsystem leads**
CDR version control	**J. Eisenstein**
Green Team	**C. Schillhahn**
Yellow Team	**K. Wheeler, S.M. Gayle**
Release A CCB focal point	**B. Ussery**
ECS CCB focal point	**J. Schessler**
CDR Oversight Group	**E. Lerner, J. Guzek, H.S. Dunn, A. Endal, P. Fingerman**
DMO	**K. Wheeler**
M&O representative	**B. Burford**
Science Office representative	**K. Cox**
SMO representative	**TBD**
RID management	**J. Guzek**
RID entry	**P. Ambardekar, D. Herring**

Documents & Production

Publication Process & Schedule

A week in the life of a 200-page document ...



Event Briefings & Logistics

- **Logistics**
- **Briefing preparation & Schedule**
- **Communications**
- **“Early Bird” pre-briefs**

Event Logistics

- **Announcement of event**
- **Facilities**
- **Select/invite Invitees**
- **Select/invite review panel**
- **Briefings (including dry run)**
- **Select donut vendor**
- **Select bagel vendor**

Briefing Preparation

- **Briefings of design at CI level**
  - **Generally organized by subsystem**
  - **Threads (if required) take interested parties into account**
  - **Overview & special topic briefings as required**
- **Process, tools, & guidelines**
- **Reviews/reviewers**
- **Resources**
- **Schedule**
  - **Rolling briefing freeze ending 8/1/95 -- 8/7/95**
  - **Rolling briefing rehearsals 8/7-8/11**

Briefing Preparation
Outline

Generic outline of CI briefing

- **What it provides vis a vis ECS system architecture/design**
- **Key design elements**
  - **Incorporation of prototyping**
- **General architecture & COTS**
- **[Hardware architecture as required]**
- **CI-to-CI and other external interfaces**
  - **HMI as appropriate**
- **Specific functional offerings**
- **Scenarios that exercise interfaces**
  - **Event traces, data flows as appropriate**
- **Risks**
- **Release migration**

Briefing package includes backup materials from OMT -- formal diagrams, etc. (not briefed, but subject to questions/discussion)

Event Schedule

- **Detailed plan to produce event**
- **Agenda of event itself**
- **Single presentation thread (as much as possible) to allow attendee to view complete design in context**
- **Demonstrations, exhibits, and poster sessions**
- **See CDR Admin BBS on CCMail for latest version**

Event Communications

- **Invitations**
- **Publication of agenda**
- **Advertise non-CDRL deliverables on EDHS**
- **Distribute deliverables**
- **Publication of briefing books**

ESDIS Coordination

- Meeting announcement 6/23/95
- Select & invite Review Panel 6/30/95
- Select & invite attendees 7/15/95
- Event agenda 6/23/95
- Document organization 6/30/95
- Design
  - Early-bird briefings 6/26/05-- 7/ 7/95
  - Design walk-thrus/inspections ongoing -- 7/15/95
- Briefing organization 7/15/95
- RID policy and RID management plan (with Review Panel Co-chairs) 8/ 7/95
- Fine-tuning success criteria 7/ 7/95

ESDIS Coordination

Road to CDR

- SAI&T workshop
- Data modeling workshop
- Developers workshop
- PW1 workshop
- Ops scenarios workshop
- EP6 objectives review
- Design telecons
- Subsystem & interface peer walk-thrus/inspections
  - Counterparts invited
- “Early-bird” briefings

ESDIS Coordination

RID Management

- GSFC-provided system
- Coordination with Review Panel
- Facilities & logistics requirements
  - Forms, workstations, etc.
- RID entry
- Agreed-upon collection/disposition processes
  - Goal: Maximize effectiveness of RID/response process
  - Cutoff
  - Acceptance criteria (true detail design RIDs)
  - Prioritization
  - Consolidation

Success Criteria

- **SOW requirements**
- **User feedback from workshops**
- **“Mel Banks” criteria**
- **Code 500 expectations**
- **Hughes Team quality standards**

Success Criteria

“Mel Banks” criteria

- **See CDR Admin CCMail BBS for document deliverables criteria, along with annotations on interpretations, assumptions, etc.**

Success Criteria

Code 500 expectations

- **Be able to determine that the detailed design of the subsystem satisfies the performance [and operations] requirements of the subsystem requirements**
- **Establish detailed design compatibility among subsystems, equipment, software, facilities, and staff**
- **Assess technical, cost, and schedule risk**
- **Be able to determine acceptability of hardware specifications, acceptability fo detailed design, performance, and test characteristics of the design solution**

Oversight - CDR Oversight Group

- In addition to normal ECS management chain
- Meets twice weekly in a stand-up
- Empowered to
  - Fix problems
  - Remove roadblocks
  - Make decisions
- Membership includes

  Ed Lerner

  Joe Guzek

  Stan Dunn

  Andy Endal

  Paul Fingerman

  Parag Ambardekar (ex officio)

Conclusion

Don’t *just* find problems, find solutions!

No whining.

Don’t pitch without a catcher!

No (blind) buck-passing.

We *can* make it happen!

Tempus fugit.

If *you* can’t make it happen, *escalate*!

Up, down, sideways -- just get help.